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(21) International Application Number: PCT/GB00/00074 (22) International Filing Date: 14 January 2000 (14.01.00) (30) Priority Data: 9900744.5 14 January 1999 (14.01.99) GB (71)(72) Applicant and Inventor: DODGE, Leyton, Stuart [GB/GB]; 1 Attlee Street, Brynmenyn Industrial Estate, Bridgend, Mid Glamorgan CF32 9TQ (GB). (74) Agents: NEWELL, William, Joseph et al.; Wynne-Jones, Laine & James, Morgan Arcade Chambers, 33 St. Mary Street, Cardiff CF1 2AB (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
(54) Title: CHILD RESISTANT CLOSURES			
(57) Abstract			
A child resistant closure for a container (12) with a threaded neck (14) having a downwardly directed abutment (20) comprises a cap with a threaded portion and a deformable skirt (26) including retention ribs (28) which co-operate with the abutment (20) to keep the closure adjacent the opening of the neck until the cap is squeezed to urge the retention ribs out of the way of the abutment (20).			

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Child Resistant Closures

This invention relates to child resistant closures and in particular, but not exclusively, to child resistant closures for use on glass containers.

5        Child resistant closures are used for many containers to reduce the likelihood of young children gaining access to medicines or hazardous substances such as solvents, powerful cleaning agents, etc. At the same time as being resistant to opening by young children it is also important that the  
10       closure may be operated and undone by adults of all ages.

Many child resistant closures rely on the principle of requiring a compound action to initiate opening. For example a known child resistant closure for glass bottles or containers comprises inner and outer parts with opposed  
15       ratchet drive portions which are urged apart by a spring bias; to open such a device requires an axial force to push the ratchet portions into engagement, together with a simultaneous twisting movement to unscrew the closure. The closure comprises two moulded parts which need to be  
20       assembled together before use and these additional moulding and assembly steps add to the cost.

In another arrangement, typically used in blow-moulded bottles or containers, the neck of the bottle is provided with one or more radial projections each having an abutment  
25       surface and a sloping flank. A one piece moulded cap is provided, having an internal thread and a depending skirt with resiliently deformable locking portions. When screwing

the cap on, the locking portions deform and ride over the sloping flanks in ratchet fashion, but turning the cap in the unscrewing sense brings the locking portions against the abutment surface. To unscrew the cap, it must be squeezed  
5 at the same time as turning so that the locking portions are displaced radially beyond the radial projections, to allow unrestricted rotation. Although this arrangement benefits from a one-piece arrangement, it does require the provision of the radial projections on the neck of the  
10 container. It is however not practical to provide these projections on a glass container because they would be difficult, if not impossible, to mould and they would also interfere with handling of the container during the bottling process. Furthermore many tamperproof seals require an  
15 uninterrupted circumferential region on the neck to locate the lower part of the seal, and changing the neck geometry would limit the number of different types of closure that could be used on such a container.

Glass bottles are preferred for many medicines and  
20 tablets because they can be easily cleaned sterilized as required, and also they do not tend to absorb vapours or liquids or contaminants.

In this specification, the terms "upwardly" and "downwardly" refer to a closure arrangement in which the  
25 neck region is pointing generally vertically upwardly.

Accordingly, there is a need for a one-piece child resistant closure for a glass container. Thus, in one aspect, this invention provides a one-piece child resistant

closure means for a glass container having a rotationally engageable neck portion.. The neck portion is preferably threaded for engagement with a correspondingly internally threaded portion of the closure means, although other types  
5 of rotational engagement are possible.

In another aspect, this invention provides a child resistant closure means for rotational engagement with a neck of a container, said child resistant closure means comprising rotational engagement means for being  
10 rotationally engaged and disengaged from said neck, said closure further including releasable retention means for engagement with a corresponding retention means on said neck or associated therewith, said closure means being adapted such that, on rotational disengagement from said neck,  
15 release of said retention means is required to allow removal of said closure.

In another aspect, this invention provides a child resistant closure means for closing a neck portion of the type comprising a distal rotational engagement portion and  
20 a proximal retention abutment facing away from the opening (hereinafter referred to as a neck portion of the type described herein) which closure means comprises a cap portion with a complementary rotational engagement portion, and retention means for retaining said closure means  
25 adjacent the neck portion to obscure the neck opening on undoing said rotational engagement portions, said retention means being releasable to allow removal of said closure means from said neck portion.

In this arrangement, the retention means is preferably such that the rotational engagement portions need to be completely undone prior to release of said retention means. This means that, unlike those closures requiring  
5 simultaneous or compound pushing and twisting, or squeezing and twisting, the closure means as described may be undone by sequential operations of twisting and thereafter release of the retention means which makes operation somewhat easier for those with weaker grips, whilst still providing a  
10 considerable resistance to opening by young children.

Preferably, the rotational engagement means comprise complementary threaded portions. Alternatively, the rotary engagement means could comprise other forms, such as a bayonet type or labyrinthine coupling.

15 Preferably the cap portion includes a resiliently deformable skirt or the like which depends from the cap portion and defines said retention means. Said retention means preferably comprises an inwardly directed rib or abutment surface which, when the skirt is relaxed, co-  
20 operates with the retention abutment on said neck portion to limit axial separation of the closure means from the neck portion, but, when the skirt is squeezed appropriately, deforms to allow full axial separation.

In one embodiment, said closure means includes an  
25 internal circumferential sealing or guide surface adapted in use to locate within the throat of the neck to guide said closure to assist rotational engagement when the closure is being applied and/or to provide some resistance to

inadvertent release of the contents when the closure is not screwed up.

Preferably, the axial dimensions of the closure means are such that, when the closure is fully unscrewed, the circumferential guide or sealing surface remains engaged in or adjacent the opening of the throat of the neck substantially until the retention abutment on said neck portion is abutted by the abutment surface on said closure means.

10 In yet another aspect, this invention provides a child-resistant closure means for rotational engagement about an engagement axis with a neck portion on a container, said neck region having a downwardly facing generally radial abutment surface, said closure means comprising rotational engagement means and releasable retention means for axially  
15 engaging said abutment surface in use to limit axial separation of said closure from said neck region, said retention means being releasable to allow complete separation of said closure.

20 The invention also extends to a bottle or container fitted with a child resistant closure of this invention.

Whilst the invention has been described above, it extends to any inventive combination of features set out above or in the following description.

25 The invention may be performed in various ways and, by way of example only, a specific embodiment thereof will now be described, reference being made to the accompanying drawings in which:-

Figure 1 is a cross-sectional view through a bottle fitted with a child resistant closure in accordance with one aspect of this invention, with the closure fully closed;

Figure 2 is a view similar to Figure 1 but with the closure rotationally disengaged but still axially retained on the neck of the bottle;

Figure 3 is an underneath plan view of the closure of this invention showing the retention ribs in the relaxed (retaining) state, and

Figure 4 is a cross-sectional view through a closure of this invention when removed from the bottle.

The closure 10 of this invention is intended to be used in conjunction with a standard form of glass bottle 12 (although the invention is not limited to such containers). In such a glass bottle 12, the neck 14 is provided with an upper threaded portion 16 beneath which is a plain cylindrical surface 18 which extends circumferentially and terminates in an inwardly directed shoulder 20 which provides a downwardly facing annular continuous radial abutment surface. Such bottles are readily available and designed for use with a wide range of caps, some of which use the inward shoulder 20, for example to retain the rolled-over lower portion of a perforated metal tamper-proof seal. In addition during the handling and filling stages, handling devices may use the shoulder 20 as a pick up or location surface. The embodiment of the child resistant closure of the present invention uses this facet of bottle design to provide a two-stage engagement.



The closure 10 has a cap portion 22 which is internally threaded and includes a cylindrical guide/sealing surface 24 which fits within the open neck of the bottle when the bottle is closed by the closure 10. A cylindrical skirt 26 depends from the cap portion and includes two diametrically opposed, radially inwardly directed ribs 28. The diameter of the skirt 26 and the sizing of the ribs 28 is such that the internal diameter of the skirt away from the rib region is greater than the outer diameter of the shoulder 20, but that the diametral spacing of the ribs 18 is less than the outer diameter of the shoulder 20, and such that there is sufficient radial clearance between the internal diameter of the skirt and the bottle neck to allow the skirt to be pinched at a location approximately 90° to the ribs so that the ribs are deformed radially outwardly of the shoulder.

In use, to unscrew the closure from the position shown in Figure 1, the closure is rotated in the appropriate direction to disengage the threads and to bring the closure to the position of Figure 2. In this position, the closure is still retained axially by axial co-operation or engagement of the ribs 18 and the shoulder 20. It should be noted that, in this position, the cylindrical guide/sealing surface 24 is in close proximity to the open neck of the bottle. Thus if the bottle contains a fluid, the sealing surface will restrict the amount of loss of contents. In addition, this surface also assists engagement of the threaded portions of the cap and bottle. This means that there is a possibility that a child having undone the cap

without removing it, may reverse the process and screw the cap up.

It should be noted that the axial length of the circumferential sealing/guide surface, and the axial spacing  
5 between the threaded portion and the inwardly directed ribs may be selected with regard to the axial spacing of the abutment shoulder for the bottle opening to provide the required interaction between the closure and the bottle neck. For example, in some circumstances it may be required  
10 that the axial disengagement be effected before the threaded portions are completely undone; it may be required that the sealing/guide surface protrudes part way into the neck of the bottle even when the threaded portions are disengaged, and so on. Also, the diameter of the sealing/guide surface  
15 may be made a tighter or looser fit within the bottle neck.

Instead of, or in addition to, the sealing/guide surface, which co-operates with the throat of the neck, the cap could have radially inwardly directed ribs (e.g. 4 at 90°) which locate on the outside of the neck to steady it  
20 during screwing and unscrewing. The internal and/or external guides act to keep the cap generally aligned with the neck prior to and whilst the cap is screwed on to the neck. This alignment is useful not only for engaging the thread, but also to reduce the possibility of leakage, to  
25 give the closure a sense of robustness and security, and to prevent the cap from being twisted to move the ribs past the abutment without squeezing the cap.

If required the cap may be stiffened at the

diametrically opposed points where the cap is squeezed, and also adjacent the ribs, e.g. by locally thickening the skirt in these regions. This feature can be useful in ensuring that the squeezing action causes the ribs 28 to be displaced sufficiently to clear the shoulder 20, by effectively providing regions of greater flexibility at the points marked 30 on Figure 3.

Claims

1. A child resistant closure means (10) for closing the opening of a neck portion (14) of a container (12) of the type comprising a distal rotational engagement portion (16) and a generally continuous and annular proximal retention abutment (20) facing away from the opening, said closure means (10) comprising a cap portion (22) with a complementary rotational engagement portion for engagement in use with the rotational engagement portion on said neck region, and retention means (28) operable in use to retain said closure means (10) adjacent said neck portion (14) to obscure said neck opening on undoing said rotational engagement portions (16), said retention means (28) being releasable to allow complete removal of said closure means (10) from said neck portion (14).
2. A child resistant closure (10) according to Claim 1, wherein the axial spacing of the rotational engagement means and the retention means (28) on said cap portion (22) are selected with regard to the axial spacing of the complementary rotational engagement means (16) and retention abutment (20), such that the retention means (28) retain the cap portion adjacent the neck region when the rotational engagement means have been completely undone.
3. A child resistant closure means (10) according to Claim 1 or Claim 2, wherein said rotational engagement means comprise complementary threaded portions.
4. A child resistant closure means (10) according to any

preceding Claim, wherein said cap portion (22) includes a deformable downwardly directed skirt (26).

5. A child resistant closure means (10) according to claim 4, wherein said retention means comprises one or more inwardly directed abutments or ribs provided on the skirt and which, when the skirt (26) is relaxed, co-operate with the retention abutment 20 to limit axial separation of the closure means (10) from the neck portion (14), but which, when the skirt is squeezed appropriately, are displaced outwardly to allow full axial separation.

6. A child resistant closure means (10) according to any preceding Claim, wherein said closure means includes an internal circumferential sealing or guide member (24) adapted in use to locate within the throat of the neck portion to guide said closure means (10) during closure.

7. A child resistant closure means (10) according to Claim 6, wherein the axial dimensions of the sealing or guide member (24) are such that, in use, when the closure means is rotationally disengaged, the sealing or guide member (24) remains engaged in or adjacent the opening of the neck portion at least until the retention means (28) substantially engage the retention abutment (20).

8. A one-piece child resistant closure means (10) for a glass container having a rotationally engageable neck portion.

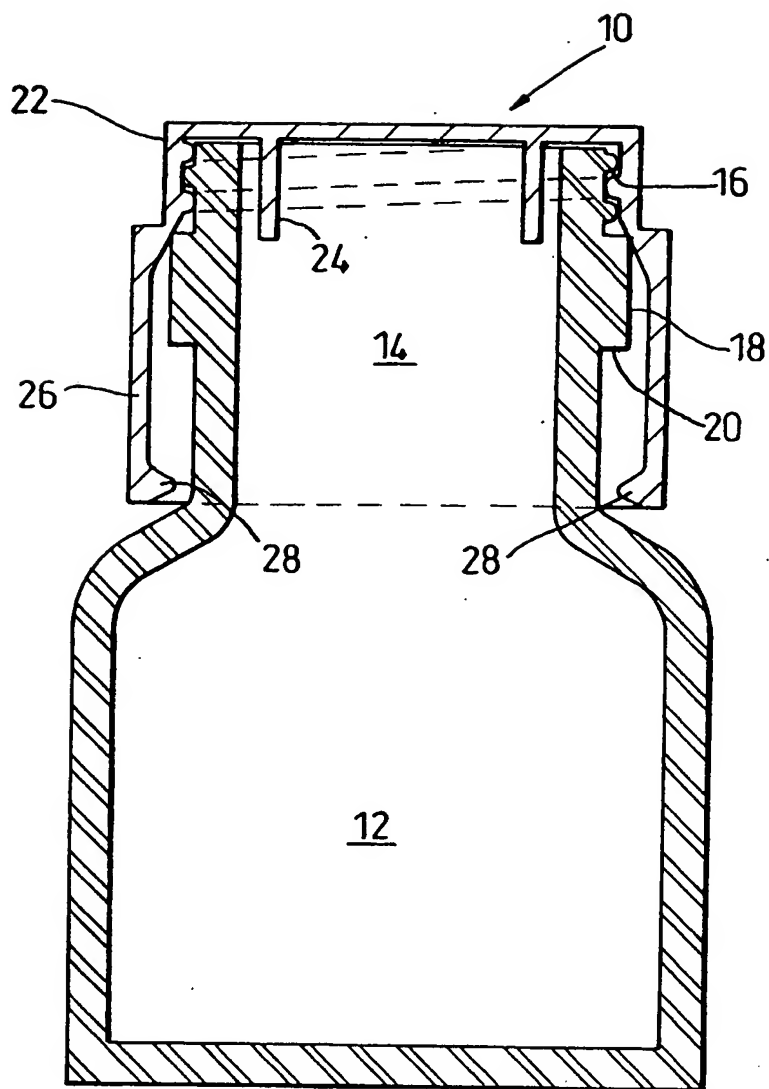
9. A child resistant closure means (10) for rotational engagement with a neck (14) of a container (12), said child resistant closure means (10) comprising rotational

engagement means (16) for being rotationally engaged and disengaged from said neck (14), said closure means (10) further including releasable retention means (28) for engagement with a corresponding retention means (20) on said neck (14) or associated therewith, said closure means (10) being adapted such that, on rotational disengagement from said neck, release of said retention means (28) is required to allow removal of said closure.

10. A child resistant closure means (10) for rotational engagement about an engagement axis with a neck portion (14) on a container (12), said neck region (14) having a downwardly facing generally radial abutment surface (20), said closure means comprising rotational engagement means and releasable retention means (28) for axially engaging said abutment surface (20) in use to limit axial separation of said closure (10) from said neck region (14), said retention means (28) being releasable to allow complete separation of said closure means from said container.

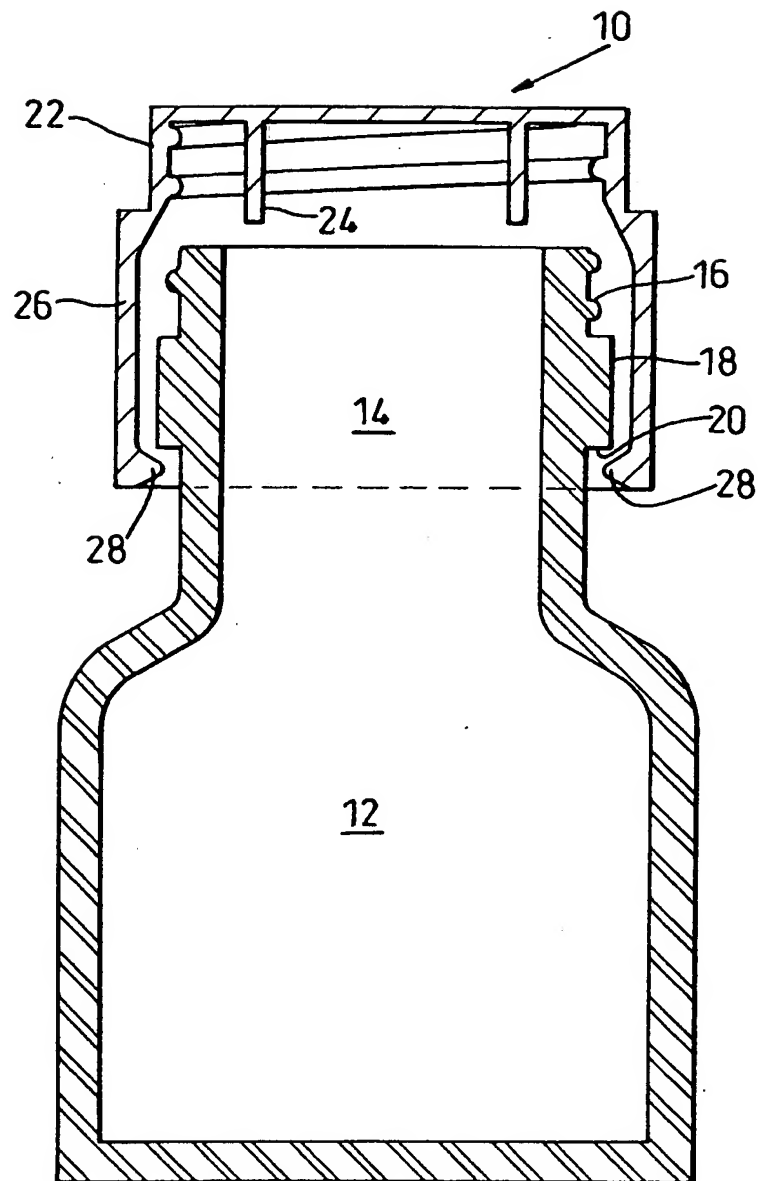
11. A bottle or container fitted with a child resistant closure according to any of the preceding Claims.

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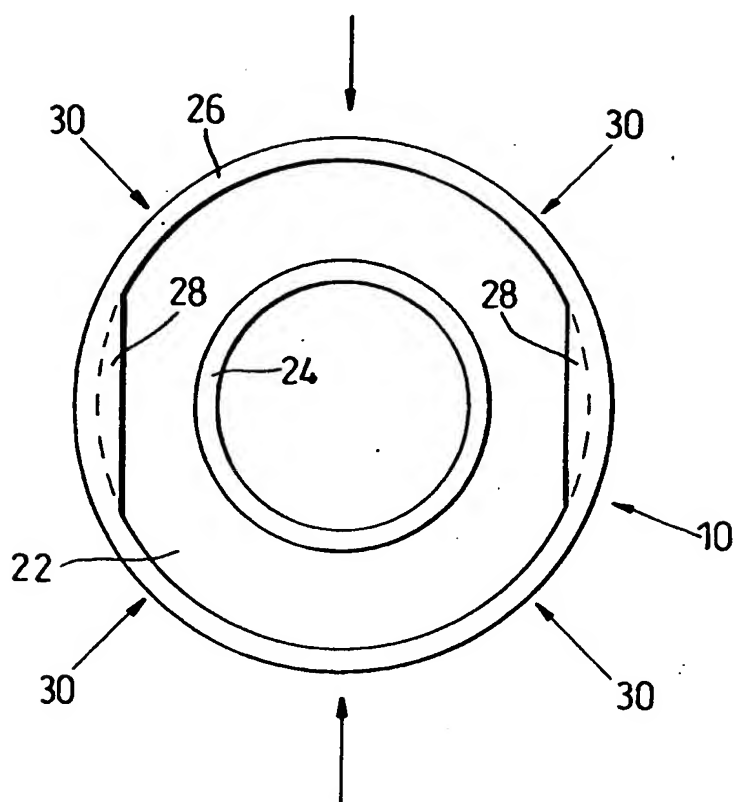
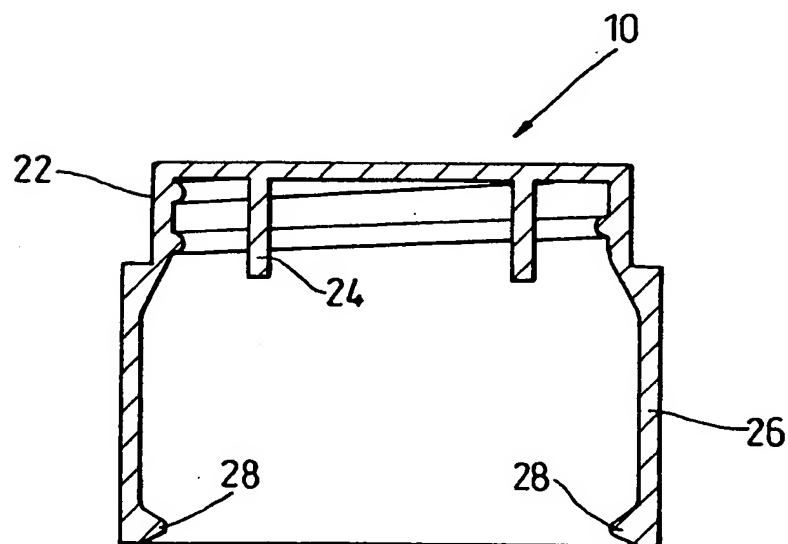
*Fig. 1*

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*Fig. 2*



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*Fig. 3**Fig. 4*

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00074

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B65D50/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 827 593 A (KRAMB K ET AL) 6 August 1974 (1974-08-06)	1-3,9-11
Y	abstract; figure 2	6
X	US 4 579 239 A (HART REGINALD J) 1 April 1986 (1986-04-01)	8,10,11
Y	column 3, line 30 - line 33; figure 5	6
A		4,5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3827593 A	06-08-1974	NONE	
US 4579239 A	01-04-1986	EP 0160474 A	06-11-1985
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		ZA 8502998 A	26-02-1986